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SERTULUM DIPTEROCARPACEARUM MALAYENSIUM VII *

D.F. VAN SLOOTEN **

SUMMARY

Critical notes, emended descriptions, and considerations on synonymy have been given of 8 species of *Dipterocarpus,* 1 of *Dryobalanops,* 1 of *Parashorea,* and 2 of *Vatica. Vatica imbricata.* van Slooten is referred to *Kayea (Guttiferae).*

Three species of *Dipterocarpus* have been described as new, viz *D. sarawakensis* and *D. tempehes* from Borneo and *D. ursinus* from Sumatra.

There is one new combination, *Hopea forbesii* (Brandis) Van Slooten, based on *Shorea forbesii* Brandis.

EDITOR'S NOTE. — The MS of the present contribution has been in the hands of the late Mr G. H. S. Wood, Sandakan. It was unearthed in the Sandakan Herbarium by Dr. W. Meijer, Forest Botanist, who is himself engaged in a study of North Borneo dipterocarps. In his opinion it should be published ; Mr Ashton, lately Forest Botanist at Brunei, shares this view. In the meantime one of the new species of Van Slooten, viz *Dipterocarpus exalatius,* has been incorporated in a posthumous paper by Mr Wood (*in* Gard. Bull. Sing. 17: 486. 1960); the full description, with citation of specimens, is given here. In a few cases Dr. Meijer has added a foot-note, and these have been marked with his initials.—C. G. G. J. van Steenis,

DIPTEROCARPUS ACUTANGULUS Vesque

Dipterocarpus acutangulus Vesque (1874) ; van Slooten *in* Bull **Jard.** bot. Buitenz. **III,** 8: 321. 1927.

The type specimen is Beccari 2913 from Mt. Matang, Sarawak.

As to its alleged identity with *D. appendiculatus* Scheff., see under that species.

Though differing slightly from the type material of *D. acutangulus* I would refer a single collection from the Malay Peninsula with it (cf. Symington *in* Mal. For. Rec. **16** : 166, footnote 1. 1943).

MALAY PENINSULA. Negri Sembilan ("Only known from the upper dipterocarp forests on Bukit Lanta, on the Seremban-Ulu Klawang boundary. It is frequent here at about 2500-2700 ft."; cf. Symington, *l.c.).*

* Part I of this series was published *in* Bull. Jard. bot. Buitenzorg **III** 16 : 430-454. 1940 ; Part II, *in* Bull. bot. Gard. Buitenzorg III 17 : 96-138. 1941 ; Part III, *ibid.* 17: 220-255. 1942; Part IV, *ibid.* 18: 229-269. 1949; Part V, *in Reinwardtia* 2: 1-68. 1952; Part VI, *ibid.* 3: 315-346. 1956.

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DIPTEROCARPUS APPENDICULATUS Scheff.

Dipterocarpus appendiculatus Scheff. (1870); van Slooten *in* Bull. Jard. bot. Buitenz. Ill, 8 : 326. 1927.

Dipterocarpus micropterus Dyer, MS, *in* Herb. 1st. bot. Firenze.

Various authors have considered *D. acutangulus* Vesque (1874 ; van Slooten, *op. cit.,* p. 320) a synonym of *D. appendiculatus,* but I have kept them distinct and derived the description from the type specimen (in L, sub no. 902. 146-91, and in U, sub no. 72495). I maintain that they are not conspecific and even belong to two different sections. With some reserve this opinion was accepted by Symington *(in* Mai. For. Rec. 16 : 165-167. 1943) who, however, arranged *D. appendiculatus* in his "Key to the fruits of Dipterocarpus" *(op. cit.,* p. 164) in both the sections *Angulati* and *Alati,* apparently taking it for one of the few species that might be considered intermediate between two sections. *D. appendiculatus* belongs, in my opinion, certainly with sect. *Alati,* as the outside of the fruiting calyx tube is winged and not ridged, the wings being up to 6. mm wide, though woody and very thick. I consider this confirmed by a specimen, collected by Beccari in Sarawak on Mt. Matang in July 1866, without field-number, and present in the Herbarium of the Botanical Institute at Florence (sheet-number 1339), with the manuscript name *D. micropterus* Dyer. This specimen, which I could examine in 1952, consists of four leaves and five fruits, all detached and' apparently picked from the ground. The fruits are obviously immature. I believe this specimen has been derived from a young tree of *D. appendiculatus ;* the wings of the fruiting calyx tube are broadly rounded at the very base and there up to 10 mm wide. They are not (yet?) woody and thick, but membranous, which may be due to the immaturity of the fruits. The two accrescent calyx lobes are also not yet full grown, but at most 7 cm long.

D.appendiculatus is at the present known from the eastern part of Sumatra, from the Malay Peninsula, and from the southern part of Borneo.

SPECIMENS EXAMINED additional to those cited by me *(op. cit.,* p. 326 and 327), with some corrections. — MALAY PENINSULA. "At low elevations in eastern Trengganu and Pahang, and in north east Johore. It is one of the common forms of keruing in Arong Forest Reserve, Johore" (Symington, *op. cit.,* p. 167).

SUMATRA. A t c h i n. West-Peureula (Emondt 5 is at the present numbered 66. *60).* — R i o u w. Lingga Archipelago, P. Singkep *(Ri/I-68,* keruwing senjum ; identification somewhat doubtful). — B a n g k a. Buluh R., 20 m (66. *20579,* ladan ; rather rare and growing scattered)'. — A duplicate of the specimen, collected by Teysmann near Batubalai and without number in Herb. Bog., is numbered in L as *7678 HB).*

BORNEO. Sarawak. Mt. Matang *(Beccari s.n.* [sheet-number 1339] : see above) — Southeast Borneo. Central Dusun Distr., Muarateweh, 30 m (66. *10012,* badjan ; rather common, though growing scattered ; identification somewhat doubtful).

DIPTEROCARPUS CAUDIFERUS Merr.

Dipterocarpus caudiferus Merr. *in* Philip. J. Sc. 29 : 398. 1926 ; van Slooten *in* Bull. Jard. bot. Buitenz. Ill, 8: 302. 1927.

Dipterocarpus macrorrhinus van Slooten *in* Bull. Jard. bot. Buitenz. Ill, 8 : 300, *fig. 3.* 1927.[1]

In 1927 I drew attention to the possible conspecificity of *D. caudiferus* and *D. macrorrhinus.* Since that year the collections have been increased considerably, confirming my tentative opinion, so that I feel justified to make the reduction effective here.

The species is strongly marked in its very slenderly caudate-acuminate leaves and in its subovoid-subconical fruiting calyx tube.

It is a medium-sized or large tree, up to 60 m tall. The wood is said to be of a good quality, (moderately) hard to stiff and strong, heavy, oily, and often very resinous ; sapwood cream of pale yellow when fresh ; heartwood light ashy red to reddish brown or dark brown ; with distinct difference between heartwood and sapwood ; timber used for house-building and constructional purposes ; resin used locally for starting fires and for torches ; bark is used for flooring,, for walls of small houses, etc.

D. caudiiferus is confined to the extreme eastern side of Borneo from the north to the south[2]. It is a species of the lowland dipterocarp forests in flat land or on hills. It is known to occur down to the forest edge of the rivers and the rivulets at 10 to 250 m altitude, but is more abundant below 60 m. Once it has been recorded from secondary forest (SAN-A. *2S17).* It is (rather) common locally and usually of rather scattered occurrence, though often growing in small groups.

In Tanahbumbu Distr. and in P, Laut the most commonly applied vernacular name is an(d)ri. From British North Borneo it has been collected several times under the general name for dipterocarps : keruing.

SPECIMENS EXAMINED. — BORNEO. North Borneo. Banguey I. *(Castro & Melegrito 1709, type* of *D. caudiferus* Merr.). — East Coast Res. Sandakan, Segaliud, Tin Mines *(KEP. 3523U),* Batu Lapan *(Wood 1990),* Tiram R. *(SAN 3178,* seruya merah), Kabili R. *(SAN.-A. 92,* excl. fruct.), Kabili-Sepilok F. R. *(KEP. 38737*

[1] By error Foxworthy *(in* Philip. J. Sc. 67 : 257 and 258. 1938) cited *D. caudiferus* and *D. macrorrhinus* as synonyms of *D. warburgii* Brandis ; see under that species in this paper.

[2] Number 66. *7866,* from West Borneo and referred by me to *D. macrorrhinus* in 1927 *(op. cit.,* p. 302), was later referred to *Dipterocarpus* sp.

[= *SAN. 4361]; KEP. 35405),* Segaliud *(SAN.-A. 114,* keruing puteh; *SAN.-A. 2317),* Betotan *(KEP. 38782* [= *SAN 4406]; KEP. 36723* [= *SAN. 3946]);* Kinabatangan Besar, Kori *(SAN.-A. 2137* and *-A. 2143,* keruing kasugoi). — S o u t h e a s t B o r n e o . Berau Distr. (66. *19119,* karup). — Kutei Distr., Area Sangkulirang-Menumbar (6&. *7976* and *7977* ', sarapan ; 66. *12548, 14754,* and *14764,* tangan tangan ; 66. *14595,* keruwing ; 66. *14617* and *14618,* tempudau ; 66. *14635,* pajau ; 66. *14771,* serapan ; 66. *14840* to *14842,* putang ; *Kostermans 6176,* tempehes). — Tanahbumbu Distr. (66. *13360* and *13361; Van Slooten 2242* to *2244;* 66. *480, type* of *D. macrorrhinus* Van Slooten ; wood sample *2419,* damar laut). - P . L a u t (66. *10198 ;* 66. *12S82,* keladan or alaran ; *Van Slooten 2288 ;* 66. *31172).*

DIPTEROCARPUS CONFERTUS van Slooten. — Fig. 1

Dipterocarpus confertus van Slooten *in* Bull. Jard. bot. Buitenz. Ill, 8: 322 *fig. 9.* 1927; *in* Bull. bot. Gard. Buitenz. **Ill,** 17 : 104, *fig. 14-* 1941.

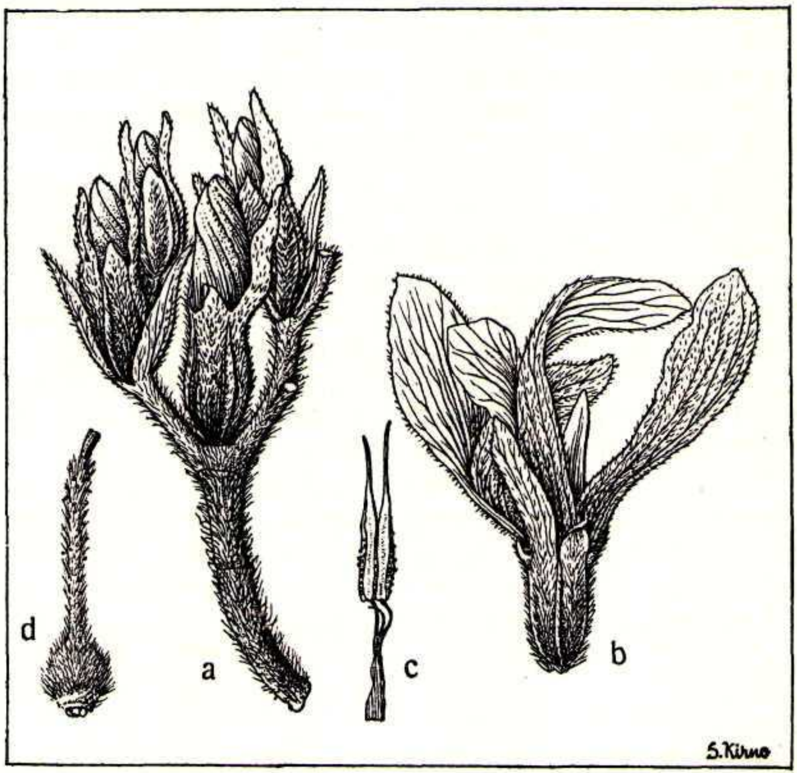


Fig. 1. *Dipterocarpus confertus* Van Slooten. a: Inflorescence **(nat.** size). — b: Expanded flower (nat. size). — c: Stamens (x 2). — d: Ovary and stylopodium (X 2). — Drawing after *A. 73* from Sandakan.

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[1] Erroneously cited as 7797 in my revision of 1927, p. 302.

The following is a description of the flowers of the Sandakan plant SAN-A. 813 with some complements about the infructescences and fruiting calyx of the Kudat plant SAN-A. 3073.

Inflorescences short and stout, whether of not dichotomously ramified, peduncles and branches densely clothed with tufts of soft, long, spreading, shining, fulvous hairs finally turning into blackish brown, the peduncle 2.5—3 cm, the branches 3—4 cm (when fruiting up to 7 cm), if ramified with a flower at the bifurcation; branches 3—5 flowered; bracts of inflorescences and bracteoles densely stellate-pubescent outside, glabrous inside ; bracteoles caducous, linear, obtuse at the top, 2—2.5 cm long, up to 0.5 cm wide, many-nerved; flowers sessile, on hardly developed nodes, about 1 cm spaced. *Calyx* tube ligneous, oblong, 1.5 cm long, 0.75 cm in diameter, 5-angular by 5 slightly prominent tomentose ridges running downward to the very base, plane and not attenuate towards the top between the ridges and there densely spreading yellowish brown stellate-pilose ; the lobes partly spreading greyish stellate-pilose outside, greyish tomentose in the upper half inside, the larger ones linear, attenuate, 2 cm long, 0.4 cm wide, the smaller ones 0.4 cm long and 04 cm wide at the base, margins reduplicate. *Petals* linear-spathulate, oblique and obtuse at the top, minutely yellowish stellate-tomentose on the parts exposed in bud, the inner side finely pubescent in the upper half, 5 cm long, at the base 0.5, above the middle 1 cm wide. *Stamens* 25, about 2 cm long ; filaments flattened below, the upper portion thinly filiform and sinuous, about 1 cm long ; anthers linear, subsagittate at the base, together with the appendage to the connective about 1 cm long. *Ovary* and stylopodium ovoid, narrowed into the style, densely and slightly patently hairy (the very base excepted) as is the linear style which is 1.5 cm long, the very top (3 mm) of the latter glabrous. *Infructescences* rather robust, simple, hairy as are the petioles, 9 cm long, bearing 6—7 fruits ; peduncles 3—4 cm long ; fruits placed about 1 cm spaced. Tube of fruiting calyx 3 cm long, up to 2 cm in diam., attenuate or rounded at the base.

Heurtwood light ashy red to reddish brown or dark brown ; timber used for housebuilding and constructional purposes (SAN-A. 3065). The decayed wood of certain forms contains considerable resin, known as tudan and used locally for starting fire torches (SAN-A. 3073).

D. eonfertus is a tree of the primary forest in low and level or undulating land up to 120 m altitude, usually on sandy soil, being (rather) common locally, but growing in scattered specimens.

As far as known at the present time it occurs inland in a large strip along the eastern coast of Borneo and North Borneo. However, if fob. 1523 from Paloh in Sambas (West Borneo) is indeed identified rightly (cf. op. *cit.*, p. 105), we may expect the species to occur in the whole of the northern half of the island.

SPECIMENS EXAMINED additional to those cited by me *(op. tit.,* p. 105, 1941). — BORNEO. North Borneo. West Coast Res., Kudat For. Distr., Labuan F. R, *(SAN.-A. 3065,* keruing daun besar or keruing etoi ; *(SAN.-A. 3073,* keruing mengkai or keruing koluh). — East Coast Res., Elopura Distr. (Sandakan), Kabili-Sepilok F. R. *(SAN.-A. 73,* keruing, fl. buds Oct. 1947), in low land, 5—30 m *(SAN.-A. 813* and *-A. 899,* keruing k(e)lukup, fl. buds June and Aug. 1948 resp.). — East Borneo. Kutei Distr., Sg. Tiram, primary forest on hilly ground on sandy soil, 15 m (66. *32553,* keruwing).

DIPTEROCARPUS EXALATUS van Slooten ex Wood

Dipterocarpus exalatus van Slooten ex Wood *in* Gard. Bull. Sing. 17 : 486, *2 fig.* 1960.

Buds (stipules) covered with a dense indumentum of very minute, stellate, yellowish brown hairs. Topmost parts of *branches* brown when dry, flattened or subtriangular, slightly ribbed, conspicuous by amplexicaulous, oblique, small, light-coloured, hairy or glabrous annuli between the leaf-scars and the insertion of the peduncles ; internodes entirely glabrous. *Leaves* brown when dry, chartaceous, oblong, attenuate, acuminate (the acumen 0.5—1 cm long), cuneate towards the base, 14—22 (—25) cm long, 5—9 (—11) cm wide, subcrenate, glabrous, the nerves on the lower surface excepted; midrib not elevated above, very prominent and finely stellate-pubescent beneath, glabrescent ; main nerves 16—20 pairs, not elevated above, prominent beneath, pubescent as is the midrib or subglabrous, curved near the margins, with a subpersistent internerval plication ; nervules visible on both sides, very slightly raised beneath ; *petioles* drying blackish, slender, thickened at the top, glabrous, 2—3 cm long. *Inflorescences* slender, whether or not bifurcate, the branches occasionally bifurcated also, flattened, glabrous and drying brown, branches with 4—5 flowers each, up to 14 (—17) cm long; peduncles slender, 2.5—4 cm long ; flowers large, placed on nodes of 2—7 mm in length, from base to top of the branches on distances of (4.5—) 3.5—1 cm from each other, narrowed into the pedicel, which usually is 3 mm (sometimes up to 10 mm) long. *Calyx* tube coriaceous or ligneous, funnel-shaped, passing into the pedicel, 1—1.5 cm long and equally wide at the top, 5-angular with 5 obtuse ridges 0.1—0.2 mm wide running downward to the very base, the sides flat, glabrous on both sides the top of the inner side excepted ; lobes coriaceous, flat at the base and 0.5—0.7 cm wide, glabrous on both sides the central portion in the lower half of the innerside excepted, the 2 larger ones hardly (developed as such or varying in length from a few mm up to 10 mm when dry, linear or oblong, obtuse, abruptly dilated at the base and only a few mm wide, the margins slightly revolute near the base, the 3 smaller ones 3—5 mm long, obtuse, the margins whether or not revolute. *Petals* firmly cohering at the base, prominently oblique-spathulate, in the middle abruptly narrowed in the lower half, in the upper half one margin remaining a long time induplicate in bud, rounded at the top, 3.5—4 cm long, in the upper half up to 1.5 cm, near the base

0.5 cm wide, minutely stellate-tomentose on the parts exposed in bud and on the upper portion inside, many-nerved. *Stamens* 30, about 2 cm long ; filaments 0.5 cm long, the base (0.2 cm) flattened, the upper portion (0.3 cm) filiform ; anthers linear, sagittate at the base, about 0.8—1 cm long ; appendage to connective aciculiformous, fleshy, 5—7 mm long. *Ovary* and stylopodium ovoid, angular to lofoed, densely dark brown hairy in the upper half, about 0.5 cm high ; style conically dilated towards the stylopodium, angular to ribbed, about 1.5 cm long, hairy as is the stylopodium the top (0.5 cm) excepted. Mature *fruits* unknown. The 3 smaller calyx lobes (shortly after blossoming) hardly accrescent ; the 2 larger ones (S.H. 1721) enlaged, subcoriaceous, lanceolate, blunt or rounded at the top, the margins revolute at the very base, glabrous, 3-nerved, the 2 lateral main nerves running up nearly to the top or branching off in the upper third part, 2.5—4 cm long, about 0.75 cm wide.

SPECIMENS EXAMINED. — BORNEO. North Borneo. Sandakan, Batu Lapan, on top of hill *(Wood 2267,* fl. buds April 1926, caruan) ; Papar Distr. (West Coast Res.), Kawang mile 18, flat land, 10 m *(SAN.-A. UZ5,* fl. April 1948, keruing simpor, flowers whitish). Tawau Distr., St. Lucia, Tiger hill *(SAN.-A. 2035,* fl. March 1948, keruing simpor, flowers whitish yellow). — Southeast Borneo. Berau, Inaran, along rivulet in primary forest on level ground *(bb. 18424,* during the westmonsoon periodically inundated ground on sandy soil, 45 m, karup, very common; 66. *12128,* never inundated ground on sandy clay, 75 m, tjempaka utan, rare and growing scattered); Betemu-aer, in primary forest on hilly ground on sandy clay, 125 m (66. *18975* and *18978,* karup and tabuloh resp., rather common though growing in scattered specimens). Upper Mahakam, Hitaja, in primary forest on steepy ground on sandy soil (66. *20644,* isak, rather common, even growing gregariously; buttresses ; bark outside grey, in section red, with little white resin ; sapwood white, fragrant ; heartwood light red, with sharp transition ; fresh wood sinking ; wood used for beams and ledges). Kutei (Sangkulirang), Rapak, in primary forest on steepy ground on sandy clay, 60 m (66. 14*616,* tempudau, rather common though growing scattered) ; L. Puhus, in primary forest on tuft-plateau, 100 m *(Endert 4855,* flowers just fallen off Nov. 1925) ; Balikpapan, Pantailangu (in forest S. Luang), along rivulet in primary forest on hilly ground on clayey soil, 20 m (66. *13913,* fl. Nov. 1929, kambalong, rather common, a few trees growing together) ; S. Tunan, in primary forest on level, never inundated ground on sandy clay, 25 m (66. *25609,* binawan, rare and growing scattered) ; Pemaluan, in primary forest on steepy ground on clayey soil, 80 m (66. *24770,* keruwing, rare and growing scattered). Pleihari, Ketapang, in primary forest on hilly ground on sandy stone, 450 m (66. *13776,* fl. buds Sept. 1929, tampudau, rather common). — P. Laut (66. *2087,* karang, timber very good).

DIPTEROCAEPUS RIGIDUS Ridl.

Dipterocarpus rigidus Ridl. *in* J. Str. Br. Roy. As. Soc. 82: 171.' 1920; Flora Mal. Pen. 1 : 217. 1922 ; Van Slooten *in* Bull. Jard. bot. Buitenz. Ill, 8 : 347. 1927 ; Foxworthy *in* Mai. For. Rec. 10: 76 *plate V.* 1932 ; Desch *in* Mai. For. Rec. 14: 64 *plate 29 fig. 3.* 1941 ; Symington *in* Mai. For. Rec. 16 : 187 *text-fig. 85.* 1943.

It is impossible to determine the section of a *Dipterocarpus* with certainty when a species is originally described from flowering material as is the case with *D. rigidus* (cf. my annotation, *op. dt*, p. 348—349). It was not until July 1931 that fruiting material was collected in the Malay Peninsula, and this made it possible to place the species in the section *Tuberculati.* With the supply of material now available the following emendations may be made :—

Leaves ovate, sometimes elliptic, 14—24 (—34) cm long, 8—16 (—22) cm wide ; sapling leaves elliptic or nearly lanceolate, with 18 or more pairs of nerves. Tube of *fruiting calyx* subglobose, tuberculate, the tubercles sometimes scantily developed, the upper part of tube in such cases sub-5-ribbed or sub-5-angled, glabrous, 2.5—3 cm high and 2.5—3 cm in diameter ; accrescent calyx lobes 14—19 cm long, up to 5 cm wide, with 3 principal longitudinal nerves running up to the top or branching off in the upper half, glabrous, the 3 short wings up to 1 cm long.

D. rigidus is known from Sumatra, the Malay Peninsula, and Borneo, where it is locally not uncommon on hills and ridges from sealevel up to 250 m altitude. Though usually being of scattered occurrence, it sometimes grows gregariously (bb. 11557 and 20521). Once it has been recorded along the sea coast (bb. 26997). It is not known from the mainland of Sumatra, but from Riouw I., P. Singkep (Lingga Arch.), and P. Djemadja (Anambas Is.) only. As to the Malay Peninsula "it occurs only in the east cf the Peninsula, having been recorded from coastal hills in Trengganu, Pahang, and Johore" (cf. Symington, *op. dt.).* In Borneo it has been found in 4 places of the central part, far remote from each other.

Vernacular names usually applied to *D. rigidus* are the following : Keruing keluang : Pahang ; Keruing or keruing kelawar : Trengganu ; Keruing pekat: Johore; Ladan or keruwing daun halus and keruwing daun lebar : P. Riouw ; Keruwing lekit and keruwing merah : Lingga Arch.

SPECIMENS EXAMINED additional to those cited by me (op. *dt.,* p. 349). — MALAY PENINSULA. Trengganu. Dungun Distr. *(KEP. 43055, 44791,* and *46501* to *4.6506);* Paka Distr. *(KEP. 26810,* keruing babi; *KEP. 26746, 26758, 44122* and 4414*1);* Kemaman Distr. *{KEP. 26985, 27018, 44110,* and *44111).* — Pahang. Kuantan *(KEP. 6635, 6836,* and *17354).* — Johore *(KEP. 1186* and *47086* to *47088).*

SUMATRA. Riouw. Riouw I. (66. *26541, 26542,* and *26996* to *26998).* — Lingga Arch., P. Singkep (66. *11557,* keruwing; 66. *28059; Ri/I-22).* — Anambas Is., P. Djemadja *(S.F. 20501,* excl. fr. : "very common Dipterocarp here").

BORNEO. Sarawak. Bintulu *(?Coll, no. 00261,* keruing durian. — East Borneo. Berau Distr. (66. *19153,* tujang; 66. *19159* and *19161,* kerup). — Dusun Distr. (66. *20521,* ketjuhi). — Upper Dyak Distr. *(bb. 27741,* bajan tuwung).

Dipterocarpus sarawakensis van Slooten, *spec. nov.* — **Fig.** 2

TYPE. — ? Coll., no. 00005, in KEP.

Gemmae indumento pilorum stellatim fasciculatorum, denso, tactu molli, lucido, fusco ; *ramulorum extremitates* angulares, pilis subintricatis stellatim dispositis mox sordidescentibus magis vel minus dense vestitae ; ramuli adulti subteretes, glabrescentes. *Folia* coriacea, plana, obovata vel obovato-rhomboidea, 8—10 cm longa, 5½—6 cm lata, apice rotundata vel subtruncata, margine fimbriata vel subglabra, in dimidia parte inferiore integra, superiore superficialiter grosse repanda, pagina superiore iuventute pilis densis adpressis lucidis vestita, statu adulto glabra costa paulum pilosa excepta, pagina inferiore nervis dense subadpresse, venis minute stellato-pilosa, nervis lateralibus 7—9 in nervum intramarginalem non semper conspicuum confluentibus ; *petioli* robusti, 1—1½ cm longi, pilosi sicut ramulus adultus, glabrescentes. *Inflorescentiae* simplices vel ramosae, 1—3-florae, 3—7 cm longae ; axis gracilis, pilis stellatis lucidis magis vel minus dense vestita, pedunculo ad 3 cm longo; pedicelli ± 3 cm longi, pilosi sicut axis; flores nodo 2—3 mm longo suffulti 1½—2 cm distantes. *Calycis* tubus subcampanulatus, dense stellatim tomentosus, in sicco alis 5 ad basim tubi percurrentibus, 1—2 mm prominentibus ; alae maiores utrinque longe et adpresse pilosae.

Section: ? Alati.

SPECIMENS EXAMINED. — BORNEO. S e r a w a k. Sungei Semengoh Reserve, in hilly habitat *(?Coll., no. 00005 in* KEP., fl. Febr. 1925, keruing).

DIPTEROCARPUS STELLATUS Vesque — Fig. 3

Dipterocarpus stellatus Vesque (1874); van Slooten *in* Bull. Jard. bot. Buitenz. Ill, 8 : 335. 1927.

Vesque founded his new species on Beccari 2555 (fruiting Sept. 1866) and 2907 (fruiting Dec. 1866), both of which originate from Mt. Matang in Sarawak. In 1927 I had neither seen these specimens, nor the two other ones cited by me *(op. cit.,* p. 336), the correctness of the identification of which I could not guarantee. In examining in 1952 the Beccari-numbers from the Herbarium of the Botanical Institute at Florence I have found *D. stellatus* to be a well-defined species. Its fruits are identical with those of *D. grandiflorus* Blanco. It is, however, in its leaves entirely distinct because of its coarsely tufted patent pubescence on buds, branches, and petioles, while the large leaves are at most 25 cm long and stellate-hairy on midrib, nerves, veins, and reticulations beneath. The infructescences are very slender, about 20 cm long, usually simple, though sometimes

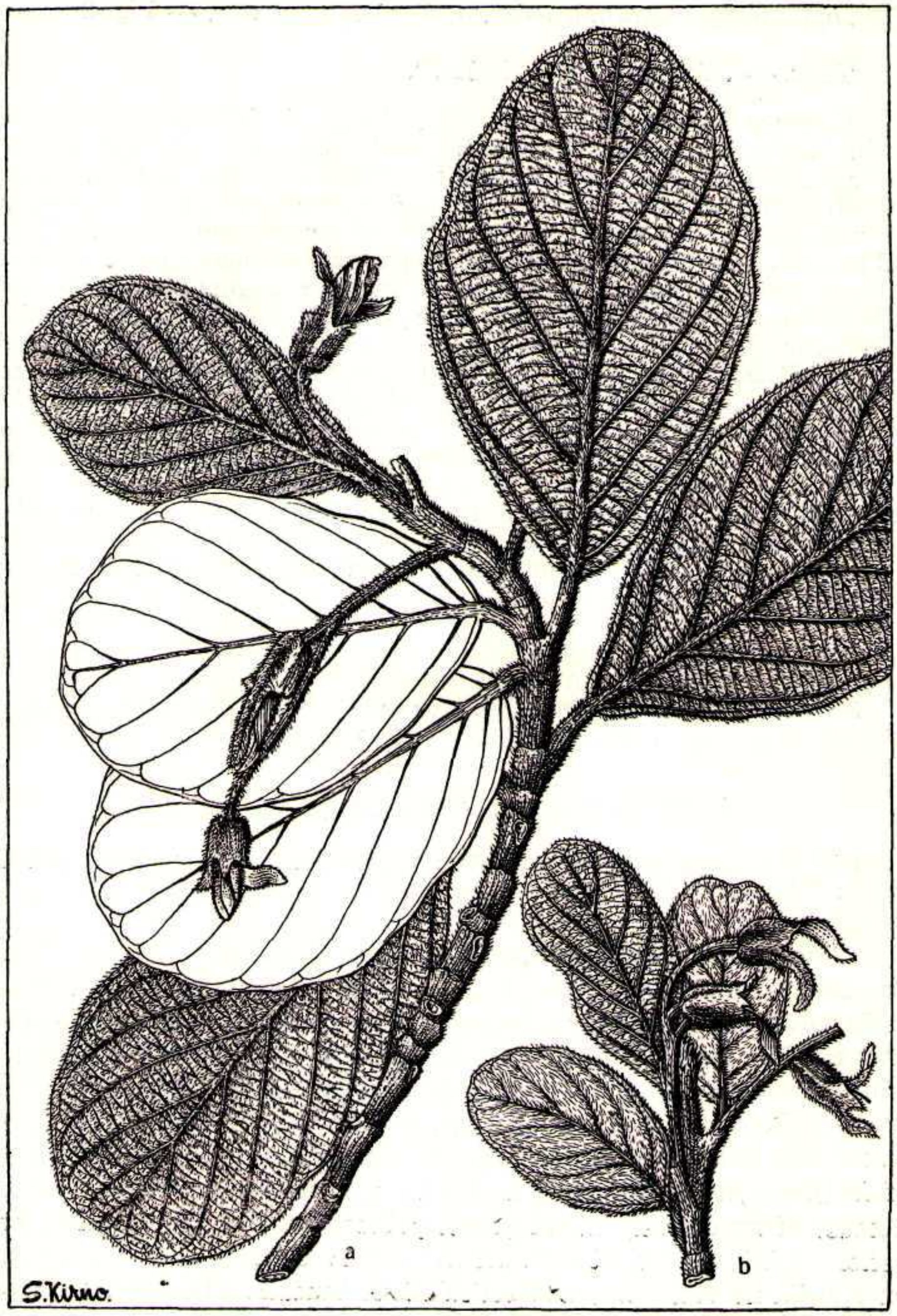


Fig. 2. *Dipierocarpus sardwakensis* Van Slooten. — a: Flowering branch (X ¾). — b: Branchlet just after blossoming (x ¾). — Drawing after *IColL, no, 00005,*

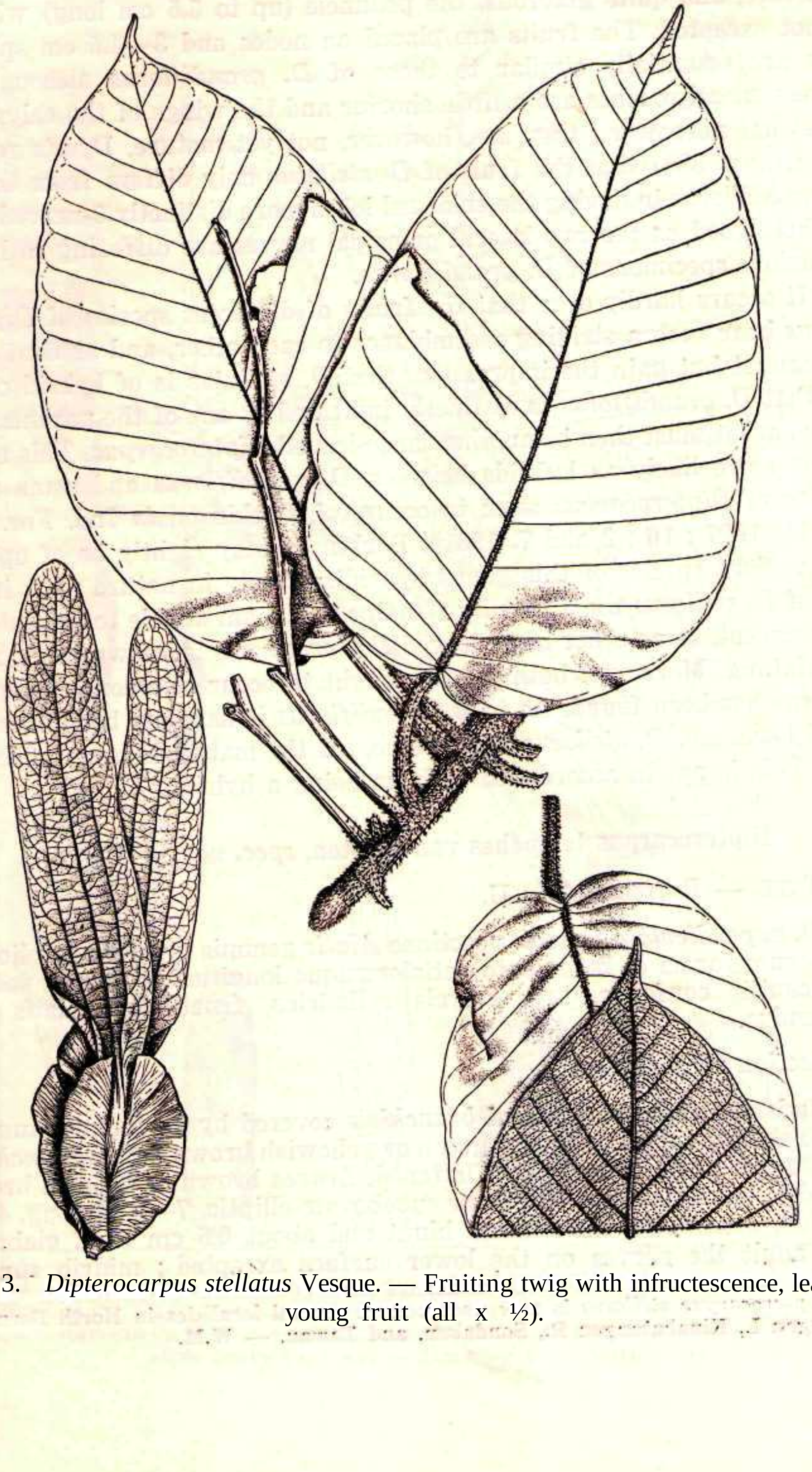


Fig. 3. *Dipterocarpus stellatus* Vesque. — Fruiting twig with infructescence, leaf, and young fruit (all x ½).

bifurcate, and quite glabrous, the peduncle (up to 5.5 cm long) whether or not excepted. The fruits are placed on nodes and 3—4.5 cm spaced ; they are essentially similar to those of *D. grandiflorus* although the accrescent calyx lobes are a little shorter and the wings of the calyx tube somewhat narrower ; they are, however, not yet mature. Dyer's remark *(op. cit.,* p. 336) that the fruit of *D- stellatus* only differs from that of *D. grandiflorus* in having the enlarged lobes more distinctly 3-nerved, does not hold good as the two lateral principal nerves are differing in length in various specimens of *D. grandiflorus.*

It occurs hardly ever that the fruits of different species of *Diptero-carpus* bear such a striking resemblance to each other, and at first sight one cannot but gain the impression, that *D. stellatus* is of hybrid origin and that *D. grandiflorus* is distinctly indicated as one of the parents. The ether parent must then be another large-leaved *Dipterocarpus.* This might be the more likely as hybrids between *D. grandiflorus* and some other species of *Dipterocarpus* seem to occur (cf. Parkinson *in* Ind. For. Rec. 13 : 11. 1927 ; 16 : 2 and 7. 1931). Parkinson may rightly be of opinion that various species of this genus hybridize freely in nature ; yet in the case of *D. stellatus* the difficulty remains that I am unable to indicate the other parent, as no other large-leaved *Dipterocarpus* is known to me from Mt. Matang. Moreover, both parents ought to occur commonly where *D. stellatus* has been found. As to *D. grandiflorus* it has only been once collected here, and *D. stellatus* itself twice, viz the materials here in discussion. This is not in accordance with its being a hybrid.[1]

Dipterocarpus tempehes van Slooten, *spec. nov.* — Fig. 4

TYPE. — *Rutten 126,* in U.

D. appendiculato Scheff. e sectione *Alatis* gemmis gracilibus, foliorum plicatorum forma et indumento petiolorumque longitudine similis, sed inflorescentiis confertis, tubo calycis cylindrico, fructibus exalatis distinguendus.

Section : Sphaerales.

Buds and topmost parts of *branchlets* covered by an indumentum of minute stellate-tufted yellowish green or yellowish brown hairs. *Branchlets* and younger parts of branches flattened. *Leaves* brown or reddish brown when dry, subcoriaceous, elliptic or subobovate-elliptic, 7—9 cm long, 4—6 cm wide, acuminate, the acumen blunt and about 0.5 cm long, glabrous when adult the nerves on the lower surface excepted ; midrib sunken

[1]*Dipterocarpus stellatus* is now known from several localities in North Borneo : Jambongan I., Kinabatangan R., Sandakap, and Tawau. — W.M.

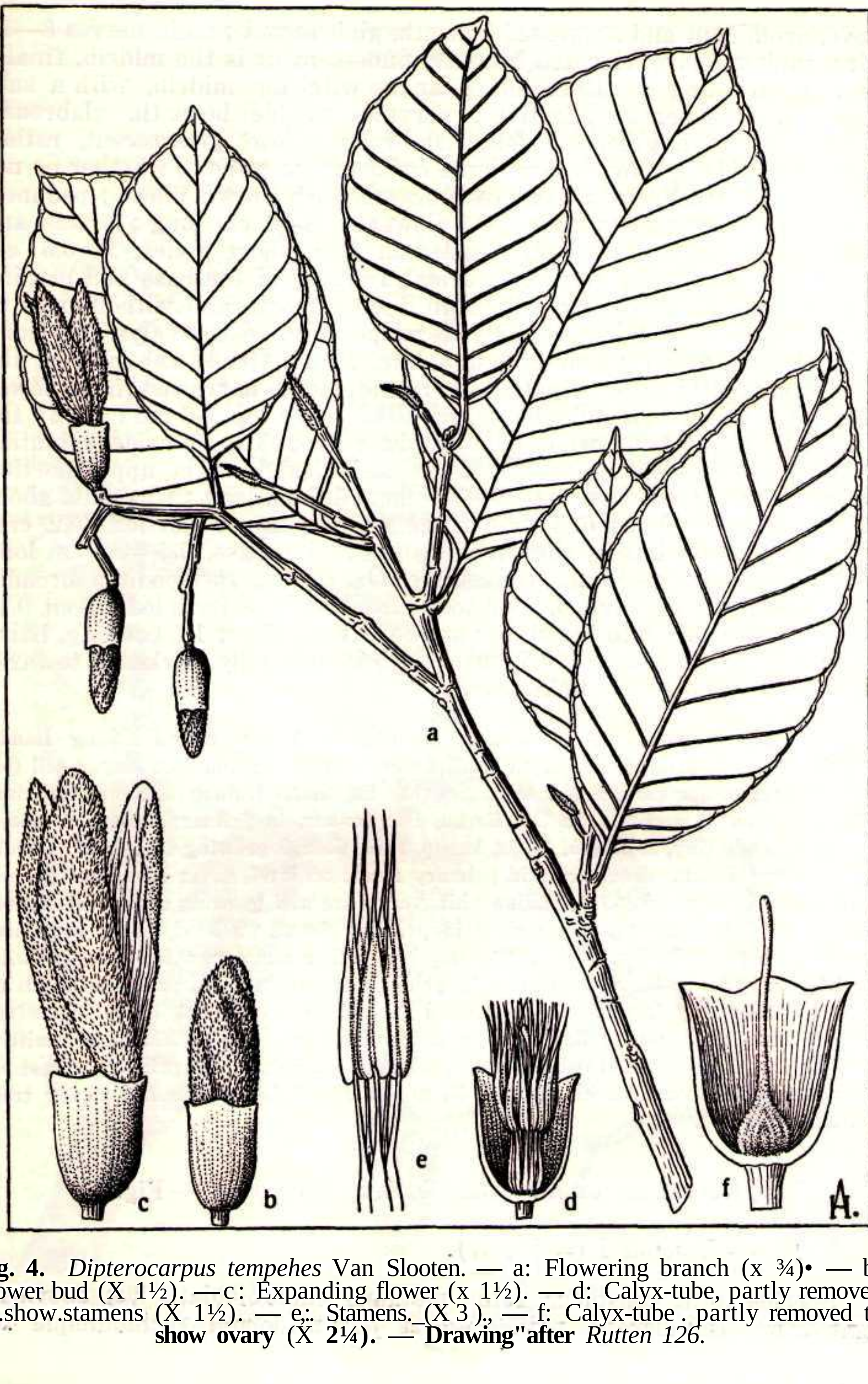


Fig. 4. *Dipterocarpus tempehes* Van Slooten. — a: Flowering branch (x ¾)• — b: Flower bud (X 1½). — c: Expanding flower (x 1½). — d: Calyx-tube, partly removed to..show.stamens (X 1½). — e,:. Stamens._(X 3)., — f: Calyx-tube . partly removed to **show ovary** (X **2¼). — Drawing"after** *Rutten 126.*

above, prominent and appressed beneath, glabrescent ; main nerves 8—10 pairs, sunken above, elevated beneath, pubescent as is the midrib, finally glabrous, forming a rather sharp angle with the midrib, with a subpersistent internerval plication ; nervules visible beneath, glabrous ; *petioles* yellowish green or yellowish-brown pilose, glabrescent, rather robust, one-sided grooved, 1 cm long. *Inflorescences* short, whether or not ramified, flattened, yellowish green or yellowish brown pilose ; peduncle up to 1.5 cm long ; branches 4—5 flowered, 3—4 cm long ; bracts and bracteoles unknown. Flowers sessile, on very short nodes, 1—0.5 cm spaced. *Calyx* tube ligneous, cylindrical, rounded at the base and passing into the pedicel, 1 cm long, 0.8 cm in diam., smooth and without ribs or ridges, glabrous, the lobes hardly developed and so the calyx tube subtruncate or the margin slightly undulate. *Petals* firmly cohering at the base, prominently oblique-spathulate, in the middle narrowed in the lower half, in the upper half induplicate, rounded at the top, 3.5 cm long, in the upper half about 1 cm wide, near the base about 0.5 cm wide, minutely stellate-tomentose on the parts exposed in bud and on the upper portion inside, many-nerved. *Stamens* 25—32, about 1.5 cm long ; filaments about 0.5 cm long, the base (0.3 cm) flattened, the upper portion (0.2 cm) filiform ; anthers linear, slightly sagittate at the base, 0.4—0.5 cm long as is the appendage to the connective. *Ovary* and stylopodium broadly ovoid, lobed, densely light brown tomentose the base included, about 0.15 cm high, attenuate into the style ; style filiform, about 1.1 cm long, hairy as is the ovarium, the top (0.5 cm), which is gradually thickened towards the end excepted. *Fruits* unknown .

SPECIMENS EXAMINED. — BORNEO. Southeast Borneo. Tidung Lands, Paimulang (?), in primary forest on level, never inundated ground on clayey soil (66. *17840,* kerup, rather rare, a few trees growing together). Bulungan, along the river Sadjau *(Rutten 35* and *126,* in U). Berau, Betemu-aer, in primary forest on steepy ground on sandy clay, 25 m (66. *19032,* karup, rare, though growing scattered). Puruk-tjahu, Dirung Pundu, along river in primary forest on level, never inundated ground on clayey soil, 60 m (66. *9953,* badjan uhit, very rare and growing scattered). Kutei, Long Beleh (Sg. Belajan), along river in primary forest on level, never inundated ground on clayey soil, 30 m (66. *23927,* tempehes, rather common, a few trees growing together); Sg. Senteken, along rivulet in primary forest on level, periodically during the westmonsoon by fresh water inundated ground on clayey soil, 50 m (66. *24007* to *24012* incl., tempehes, rather common, a few trees growing together, bark with a small or large quantity of white resin). Sampit, Sangsang, in primary forest on never inundated ground on clayey soil, 30 m (66. *10543,* bajan, common, a few trees growing together).

Dipterocarpus ursinus van Slooten, *spec. nov.* — Fig. 5

TYPE, — *Emondt I* (= *bb. 57).*

Species nova conspicua foliis maximis suborbiculatis vel obovatis, gemmarum ramulorum petiolorum et pedunculorum rachidumque in-

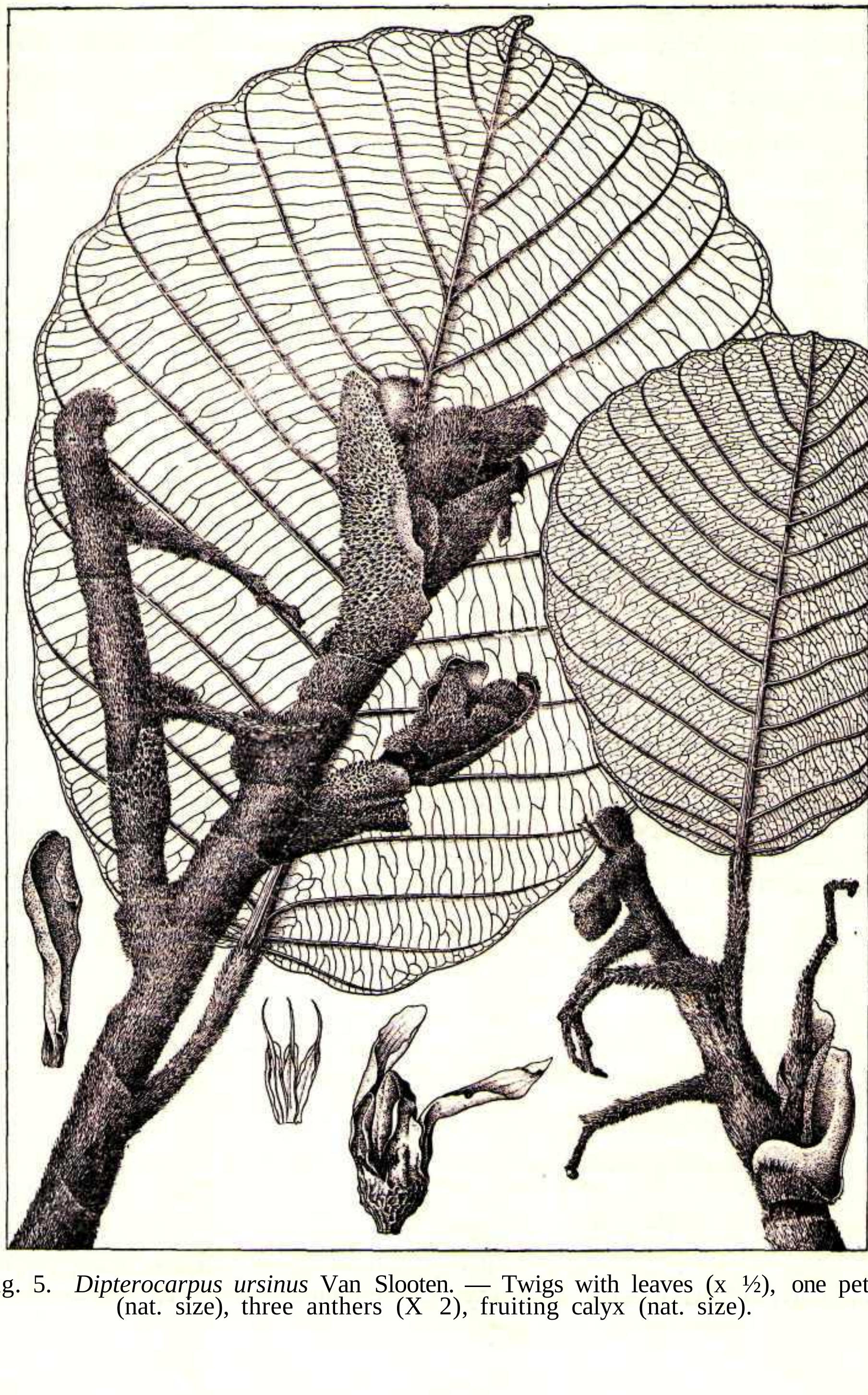


Fig. 5. *Dipterocarpus ursinus* Van Slooten. — Twigs with leaves (x ½), one petal (nat. size), three anthers (X 2), fruiting calyx (nat. size).

dumento densissimo longe stellato-hirsuto pellem ursinam imitante et inflorescentiis brevissimis robustis facile distinguenda. Fructus ignoti.

Section : ?Angulati.

Buds (stipules), branehlets, branches, petioles, peduncles, and *ramifications of inflorescences* very densely fuscohispidous by penicillate tufts of long, soft, spreading, shining, (yellowish-) brown hairs, drying dark, the tufts subpersistent, *branches* and *petioles* finally glabrous. *Stipules* amplexicaulous, very large, obviously greatly varying in shape and length, up to 12 cm long and 6 cm wide, glabrous inside, with numerous nerves. *Leaves* chartaceous or papyraceous, suborbicular-obovate, rarely suboval, rounded at the top, slightly cuneate towards the obtuse or subtruncate base, 25—35 cm long, 23—28 cm wide, either glabrous on both sides the very base of the midrib whether or not excepted, or midrib and main nerves pubescent and ultimately glabrous ; midrib not elevated above, very prominent beneath ; main nerves 13—18 pairs, not elevated above, prominent beneath, their insertions 2—2.5 cm spaced', curved near the margin, with a subpersistent internerval plication ; nervules visible on both sides, slightly elevated beneath, forming conspicuous parallel lines ; *petioles* very robust, thickened at the top, ultimately glabrous, 5—8 cm long. *Inflorescences* robust, usually simple, short and stout, about 7 cm long, 4—7 flowered ; peduncle short and thick, up to 3 cm long ; rachis thinner and less densely hirsute ; flowers from base to top 2—0.5 cm spaced. Mature flowers unknown, only shortly pedicelled *flower buds* being present. *Calyx* tube ligneous, funnel-shaped , 1 cm long, at the top about 1 cm in diam, sub-5-angular though without conspicuous ridges, shrivelled, brownish stellate-pubescent, very soon glabrescent ; lobes fleshy, at the base flat and 7—8 mm wide, slightly stellate-pubescent on both sides, very soon glabrous the central portion in the lower part of the inner side excepted, the 2 larger ones linear, rounded at the top, with 3 main nerves running up to the very top, up to 3 cm long, the margins revolute at the base, slightly crispy in the upper half, the 3 smaller ones 1—1.5 cm long, obtuse, the margins revolute up to the top. *Petals* linear-spathulate, rounded at the top, minutely yellowish brown stellate-tomentose outside, the inner side finely pubescent in the upper half, 3.5—4 cm long, 0.5 cm wide at the base, about 1.2—1.5 cm wide near the top. *Stamens* 32 ; filaments flattened below, filiform in the upper portion; anthers linear, about 0.5 cm long ; appendage to connective 0.3—0.4 cm long (the rest too immature for description).

With its thick branches with an extremely dense and coarse indument consisting of large tufts of long stellate hairs, which strongly remind of a bear's fur and which also occur on the buds, petioles and the inflorescences, as well as by its extremely large leaves which are often nearly orbicular or broadly obovate (in this respect reminding those of *D. confertus* van Slooten), this tree must be a very conspicuous and beautiful one in the

field. Though it had already been collected in 1914 and later on in 1921 and 1923, I did not describe it due to lack of fruits, which are needed for establishing the section to which the species belongs. Though new collections are not available I do not wish to postpone a description much longer where a species is concerned which is very distinct by the characters named above. It may belong to the section *Angulati;* however, nothing can be predicted with certainty about the development of the calyx tube which is strongly shrivelled in bud.

D. ursinus is a tree of the primary forests of the northern half of Sumatra, occurring on dry, level, land or on hills, obviously on clay, reaching an altitude of 600 m. Locally it can be very common though always growing in small groups. The biggest tree collected (bb. 5623) is 35 m tall, its bole reaching a height of 23 m ; of bb. 5339 the bole was 21 m high, the tree 27 m overall. The bark contains a small quantity of blackish resin.

SPECIMENS EXAMINED. — SUMATRA. Atchin. Langsa Distr., West Peureula *(Emondt I* = 66. *57,* lagan) ; Singkel Distr., M. Batu batu (66. *1791,* lagan). — Tapanuli. Angkola and Sipirok Distr., Sajur Matinggi, 600 m (66. *5623,* lagan). — Eastcoast of Sumatra. Simelungun Distr., Besar Maligas, 50 m (66. *5339,* damar ranggas). . —

DIPTEROCARPUS WARBURGiI Brandis

Dipterocarpus warburgii Brandis *in* J. Linn. Soc, Bot., 31: 32. 1895; Poxworthy *in* Leafl. Philip. Bot. 6 : 1952. 1913 ; *in* Philip. J. Sc, Bot. 13 : 178, 1918 ; Merrill, Enum. Philip. Fl. PI. 3 : 91. 1923 ; van Slooten *in* Bull. Jard. bot. Buitenz. Ill, 8 : 305. 1927 ; Foxworthy *in* Philip J. Sc. 67 : 256. 1938 (excl. syn. *D. caudiferus* Merr. and *D. macrorrhinus* van Slooten).

? *Dipterocarpus elongatus* Korth., Verh. Nat. Gesch. Ned. Overz. Bez., Bot. ("Kruidkunde"), 62. 1839-'42 ; Blume, Mus. Bot. 2 : 36. 1852 ; Miquel, Fl. Ind. Bat. 12 : 498. 1859; Annales Lugd.- Bat. 3 : 83 and 85. 1867; De Candolle, Prodr. 16^2 : 613. 1868 ; Dyer *in* J. Bot. 12 : 108. 1874 ; Burck *in* Ann. Jard. bot. Buitenz. 6 : 203. 1887 ; Brandis *in* J. Linn. Soc, Bot., 31 : 40. 1895 ; Merrill, Bibl. Enum. Born. PL, 398. 1921 ; Van Slooten *in* Bull. Jard. bot. Buitenz. **Ill,** 8 : 272. 1927.

Dipterocarpus pilosus (non Roxb.) ; F.-Vill., Noviss. App., 20. 1880 ; Vidal, Syn. Atlas 15 : *pi. It fig. c.* 1883 ; Foxworthy *in* Philip. J. Sc, Bot., 6 : 244 *pi. 34.* 1911 (excl. syn. *D. baudii* Korth., ? *Anisoptera palembanica* Miq., and. *D. macroearpus* Vesque) ; *in* Philip J. Sc, Bot., 13 : 176. 1918.

? *Dipterocarpus affinis* Brandis *in* J. Linn. Soc, Bot., 31 : 31. 1895 ; Whitford *in* Bur. For. Bull. 10^2 : 70 *pi. 72* and *73.* 1911 ; Foxworthy *in* Philip J. Sc, Bot., 6 : 246 *pi. 35.* 1911; *in* Philip. J. Sc, Bot., 13: 176. 1918; Merrill, Enum. Philip. Fl. PI. 3: 88. 1923.

Dipterocarpus lasiopodus Perkins, Frag. Fl. Philip., 22. 1904 ; Merrill *in* Govt. Lab. Publ. 29 : 30. 1905 ; Enum. Philip. Fl. PI. 3 : 90. 1923 ; Reyes *in* Philip. J. Sc. 22: 322 *pi. 13.* 1923.

Dipterocarpus woodii Merr. *in* Philip. J. Sc. 29 : 399. 1926 ; Van Slooten *in* Bull. Jard. bot. Buitenz. Ill, 8 : 303. 1927.

The type specimens of *D. elongatus* Korth. (910-62—130 and 902.146—101 in L, and 35952 in U) consist of juvenile leaves (40—53 by 17—18 cm, and 30—36 pairs of nerves) with a dense indument on stipules, petioles, and young twigs. This indument consists of penicillate tufts of long, coarse, stiff hairs. Brandis *(op. cit.,* p. 32) has already pointed out that *D. elongatus* "agrees well with *D. affinis,* and it is not impossible that more complete specimens of the two species may show their identity, in which case Korthals's name will take precedence". In my opinion this conspecificity is very likely, but the fact remains that because of the inadequacy of the types of both *D. elongate* and *D. af finis* the synonymy will remain disputable and can never be settled with certainty. I agree therefore with Foxworthy *(op. cit.,* p. 257. 1938) to accept the name *D. warburgii,* which is unambiguous.[1]

As to *D. woodii* Merr. I can see no reason for keeping it distinct. In *D. woodii* the lower parts of the axes of infructescences are quite glabrous, indeed, but this may also occur exceptionally in *D. warburgii.* The type and only specimen of *D. woodii* has immature fruits (still) without protuberances. In *D. warburgii* these tubercles may be developed very superficially. Such fruits could be considered to be intermediate between the sections *Sphaerales* and *Tuberculati.* Well-developed fruits, however, undubitably place it in the last mentioned section.

Tree up to 45 m tall without or with buttresses up to 3 m high. *Wood* (moderately) hard, stiff, strong and heavy, containing a great quantity of sticky clear resin, which exudes from the sapwood ; *sapwood* cream or pale yellow when fresh ; *heartwood* dark or reddish brown ; timber good, hard to saw owing to the resin, used for making native canoes (bancas) and for house building constructional purposes ; the resin is used locally for torches.

D. warburgii has been found in the eastern half of Borneo from south to north[2], while it is "uniformly distributed throughout the Philippines where the dry season is not pronounced" (Whitford, *op. cit).* It grows always in primary forests on clayey or sandy soil. Though sometimes

[1] Van Slooten considered the leaves of *D. elongatus* to have been derived from juvenile trees. I have seen these specimens and share his opinion. In the field it has appeared, however, that it is more likely that they belong to *D. humeratus* van Slooten. I agree with him not to replace *D. warburgii* by *D. elongatus.*___W.M.

This shows the wisdom of our careful, experienced former colleague. — Ed.

2 Number bb. 7855, mentioned by me (op. *cit.,* p. 306) and originating from West Borneo, has turned out to belong to *D. apterus* Foxw.

occurring in the plains on level ground or on the lower slopes of ridges, it frequents flat land near or along rivers which during the wet monsoon is periodically inundated, or it grows in swampy forest or in peat. In my opinion Korthals was not justified to state that the habitat of the trees of *D. elongatus,* which he collected at the river Punin, a tributary of the Barito river, was not original as they would have originated from fruits washed down. According to Foxworthy *(op. dt.,* p. 258. 1938) "it is perhaps most often found on alluvial soil, usually in tolerably well-drained situations. A few collections were said to have been made from limestone hills".

Locally *D.warburgii* is (fairly) common, growing in scattered specimens, though it is also reported as occurring "very common, growing gregariously", both in Borneo (bb. 12082 and 20018) and in the Philippines. In Borneo it occurs between 2 and 100 m altitude ; in the Philippines it is said to occur up to about 150 m. The period of flowering lasts from April to December, that of fruiting from June to March.

Reliable vernacular names, which are locally in general use, are the following : Kesugoi or kesugui : North Borneo ; Karup or kerup : North-eastern part of Borneo ; Tampudau or tempudau, and (damar) kaladan or (damar) keladan : from Kutei to the south.

SPECIMENS EXAMINED. — BORNEO. North Borneo. Banguey I. *(Castro & Melegrito 1404,* fr. June 1923, *type* of *D. woodii* Merr.). — Tiga Is. *(SAN. 2753).* — Labuan and Interior Res. Kiaroh *(SAN. 2962) ;* Mengalong F.R. *(SAN. 3188).* — East Coast Res. Kinabatangan Besar *(SAN.-A. 2140,* keruing), Lahad Datu *(SAN.-A. 272, -A. 274,* and *-A. 2492,* keruing klukup), Marotai *(SAN. 3691,* keruing). — South-east Borneo. Tidung Lands (66. *22865,* karubung ; b6. *26236,* kerubung pandjang daun), P. Nunukan (66. *19783,* keruwing ; 66. *20018).* — Berau Distr. (66. *11525* and *12082).* —Kutei Distr. (66. *7129 ; Endert 1801,* and *1802,* selekep ; 66. *14965, 15612, 15614, 24001* to *24006,* and *33705).* — *Lower Dyak Distr.* (? *Korthals s.n.* in L., sub no. 910.62—130, *type* of *D. elongatus* Korth. ; 66. *2095, 5549, 8201,* and *9434).* — Marabahan Distr. (66. *1147).* — Tanahbumbu Distr. *(Van Slooten 2109).*

PHILIPPINES. Distributed throughout the Archipelago from the north to the south (i.a. ? *Vidal 82* from Province of Camarines, Luzon, type of *D. affinis* Brandis, and *Merrill Z031* from Province of Tayabas, Luzon, *type* of *D. lasiopodus* Perkins).

DEYOBALANOPS KEITHII Symington. — Fig. 6

Dryobalanops keithii Sym. *in* Gard. Bull. Str. Settl. 10 : 379. 1939 ; Van Slooten *in* Bull. Jard. bot. Buitenz. Ill, 16 : 449. 1940.

TYPE. — *For. Dept. F. M. S. 44382 (= SAN. 9070).*

The species was originally described in 1939 by Symington from a collection by Keith in North Borneo with immature fruits. In 1940 I could

add some other collections all being, however, sterile. On the basis of 2 sheets of this species from North Borneo, viz A. 2587 and A. 1444, the former in flower, the latter in fruit, the following emended description of the flowers and fruit can now be drawn :

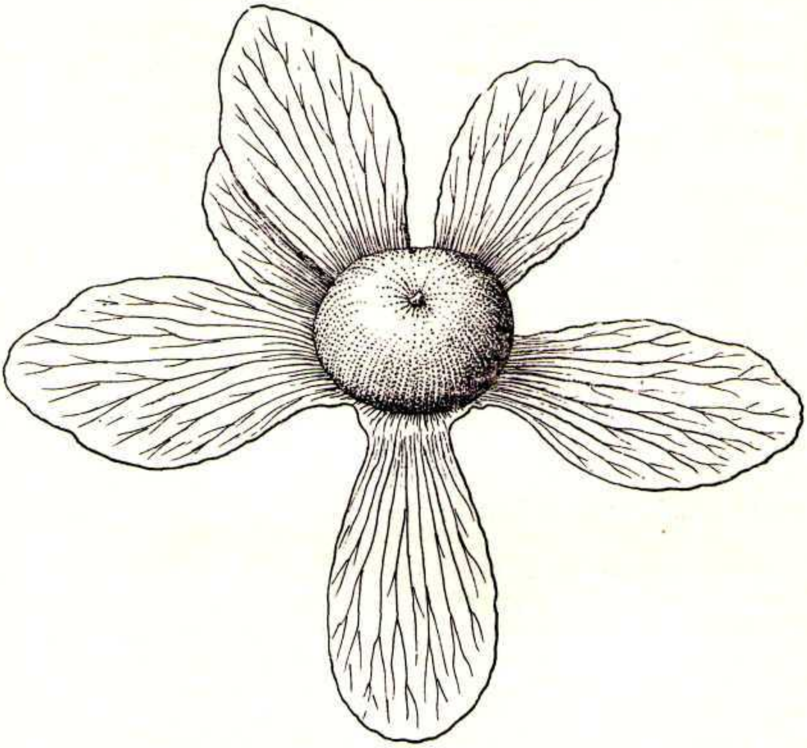


Fig. 6. Mature fruit (nat. size) of *Dryobalanops keithii* Sym., after *A. 1444* from Br. N. Borneo.

Inflorescences glabrous, up to 20 cm long ; peduncles about 2 cm long ; solitary branches 3—4-flowered, 2—3 cm long, provided with caducous bracts and semi-persistent, glabrous, paired bracteoles which subtend the flowers. *Flowers* pedicelled ; pedicels glabrous, grooved and ribbed when dry, 2—3 mm long, dilated towards and gradually passing into the glabrous calyx tube which is 3 mm long. *Calyx lobes* spreading during anthesis, ovate-oblong, 6 mm long, 4 mm wide at the base, attenuate, obtuse, glabrous, many-nerved. *Petals* lanceolate, attenuate towards both ends, glabrous, 1.5 cm long, above the very base 0.5 cm wide. *Stamens* 25 (a single flower examined), glabrous, 6—7 mm long ; filaments about 3 mm long, the filiform portion very short ; anthers linear, 3—4 mm long ; appendage of connective less than 1 mm long. *Ovary* conoidal, about 1.5 mm high, glabrous, passing into the glabrous style about 7.5 mm long. *Fruiting*

calyx tube and stalk about 1 cm long, glabrous ; lobes equal, obovate-elliptic, the apex rounded or obtuse, glabrous, 4—4.5 cm long, 2 cm wide, the narrow base less than 1 cm wide, many-nerved. *Nut* ligneous, sub-globular, somewhat flattened at the top, crowned by the basal part of the style, glabrous, about 2 cm in diameter.

The duplicate of A. 1444 in BO bears a single fruit with 6 wings which is of course an abnormality.

SPECIMENS EXAMINED additional to those cited by me in this bulletin (op. *cit.*, p. 449). — BORNEO. North Borneo. Elopura Distr., along the Gomantong track, 15 m *(SAN.-. 1444,* gumpait or kapur merah, tree about 25 m high, "wood hard and heavy, it does not have the characteristic of kapur ; sapwood whitish or yellowish, distinct from heartwood, heartwood light to dark reddish brown turning darker on exposure"), Gomantong F.R., level land *(SAN.-A. 2598,* gampahit, fl. June 1949, tree about 21 m high, flowers yellowish white).

Hopea forbesii (Brandis) van Slooten, *comb. nov.*

Shorea forbesii Brandis (1895) ; van Slooten *in* Reinwardtia 2 : 61, 3.1952.

Shortly after the publication of my Sertulum Dipterocarpacearum — V *(1.* e.) I received a fruiting specimen of this species (NGF 4151) which settled the question about its true status *(op. eit.,* p. 63). Symington's assumption has turned out to be right. It was at once clear that *Shorea forbesii* has to be referred to the genus *Hopea.* I wrote "that the third sepal immediately after blossoming attains the shape of the two outer ones ; apparently it will grow out to a third large segment". This remark has proved to be founded on an exact observation. The fruit may, indeed, differ from a normal *Hopea* fruit in having sometimes the third sepal much longer than the two other inner ones, which remain shorter than the nut.

The description of the species now may be emended with that of the fruit as follows :

Fruit a 2-winged nut, all parts glabrous ; stalk short but prominent, about 1 mm long ; 2 outer calyx lobes chartaceous, spathulate, 5—7 cm long, about 1 cm wide near the rounded: top, very narrow towards the base, the very base rather woody and closely appressed to the lower part of the nut, 7-nerved ; 3 inner lobes broad, irregular or acute at the apex, not enlarged beyond the lower three-fourth of the ripe nut, 1—1.4 cm long, one of these sometimes developed into a short rudimentary wing 1 cm long or less. *Nut* ovate-conical, up to 1.5 cm long, attenuate, crowned by a short but prominent sharp apiculus whether or not shining with a resinous coating, the lower two-third of it closely embraced by the imbricate inner lobes, free on the upper third.

The number of *Shorea* species from New Guinea has by this reduction been decreased from three to only two, both unnamed, viz a probably new

species in West New Guinea and another one in Central New Guinea which cannot yet be described *(op. cit.,* p. 3, 5, and 61-63).

SPECIMENS EXAMINED additional to those cited by me (op. *cit.,* p. 63). — NEW GUINEA. Eastern part. Vanapa area, Koitaki forest, 450 m *(Carr 12550,* fl. June 1935) ; Sogeri region *(NGF 2794* and *4151,* fr. July 1951 ; tree 37 m high, scarcely buttressed ; sap-wood undefined, fairly easy splitting).

PARASHOREA APTERA van Slooten

Parashorea aptera van Slooten *in* Bull. Jard. bot. Buitenz. Ill, 8 : 377 *fig. 3.* 1927, non *P. aptera* sensu Foxworthy *in* Mai. For. Rec. 10 : 243. 1932.

Since 1927 herbarium materials of this Sumatran species have accumulated considerably. Together with those already cited by me *(op. cit.,* p. 379) they are listed below. The species is not known from outside Sumatra and is closely related to *P. densiflora* van Slooten & Symington *(in* Gard. Bull. Str. Settl. 10 : 373 plate 24. 1939), which has so far only been recorded from the Malay Peninsula and was formerly confused with *P. aptera* by Foxworthy *(I.e.).*

P. aptera occurs in the central part of Sumatra, where it is locally (rather) common and of scattered occurrence on flat land or on hills, usually growing on dry ground from 5—100 m above sealevel, ascending to 350 m. Exceptionally it grows on ground that is periodically inundated during the westmonsoon *(bb. 264-77* and *26500),* or on boggy clay along marsh *(bb. 2764-6).* Once it was recorded growing gregariously *(bb. 23475).*

In the Labuanbatu District (Eastcoast of Sumatra) *P. aptera* is known as tjengal, while for the Kuantan District and the Indragiri Uplands (Riouw) the vernacular names kujung and te(m)balun are recorded.

SPECIMENS EXAMINED. — SUMATRA. Eastcoast of Sumatra. Labuanbatu Distr. (66. *8974,* meranti horsik ; 66. *32755* to *32762,* and 66. *32813* to *32816);* Siak (66. *90,* maribol). — Westcoast of Sumatra. Sidjundjung Distr. (66. *23008,* lakung), Bangkinang (66. *23016,* mantidaun; 66. *32697,* meranti merebu). — Riouw. Kuantan Distr. (66. *23475, 24808, 24830, 26477, 26500,* and *27668) ;* Indragiri Uplands (66. *27553, 27646,* and *28584).* — Palembang. Rawas Distr. *(Dumas 1629,* ngerawan batu ; *Grashoff 1028,* marakunjit lawang).

VATICA IMBRICATA van Slooten

Vatica imbricata van Slooten *in* Bull. Jard. bot. Buitenz. Ill, 16 : 452. 1940.

This species has to be reduced. A long time ago Symington drew my attention to the fact that the specimen in question (SAN. 2587 from Brunei) represents a *Kayea (Guttiferae).* Species of this genus may be locally common in the dipterocarp forests. Obviously I have been confused

by the native name resak bunga, in North Borneo used for various species of *Vatica.*

VATICA RAMIPLORA van Slooten

Vatica ramiflora van Slooten *in* Bull. Jard. bot. Buitenz. Ill, 9 : 118. 1927 ; *in* Bull. bot. Gard. Buitenz. Ill, 17 : 240. 1942.

I founded my species upon some collections made by Elmer in North Borneo. Up till the present nothing could be added to our knowledge concerning the distribution of the species. Two other collections from the southern part of Southeast Borneo and cited below, I now consider to belong to it as the size of their leaves, the number of their nerves, the compactness of their inflorescences, and other characters are very similar, although *V. ramiflora* is lacking their distinct shining pubescence along midrib and main nerves.

SPECIMENS EXAMINED additional to those cited by me (ll. *cc,* p. 119 and 241). — BORNEO. Southeast Borneo. Pleihari Distr., Kintap, primary forest on level dry ground, 150 m (66. *13470,* fl. Nov. 1928, damar tingkis or tjangal padi ; rather common). — P. Laut. Tj. Serdang, along the Pinang rivulet in primary forest on hilly ground, 25m (6b. 14*089,* fl. Dec. 1929, damar tingkis ; common).

INDEX OP SCIENTIFIC NAMES AND SYNONYMS

(Synonyms in italics, new species and combinations in bold type ; an asterisk means the presence of a figure)